

ABSTRACT

THESIS: The Effects of the Psychiatric Drug Carbamazepine on Freshwater Invertebrate Communities and Ecosystem Dynamics

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DATE: May, 2014

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Carbamazepine has become a compound of concern due to its ubiquity, potential toxicity and persistence in surface waters around the world. Carbamazepine is a psychiatric drug used to treat epilepsy, depression, addiction and bipolar disorder. Currently, understanding of how carbamazepine affects freshwater organisms, populations, communities and ecosystems is limited. Descriptive assessments coupled with *in vitro* and *in situ* experiments were conducted to assess how freshwater ecosystems respond to carbamazepine at environmentally relevant concentrations. Carbamazepine was detected in central Indiana streams (1 – 88 ng/L) and potentially altered macroinvertebrate species composition and food resources in the Upper White and Mississinewa River watersheds. Additionally, results from an *in vitro* experiment indicate that carbamazepine may increase abnormal behavior and retard development of mayfly nymphs at concentrations found in surface waters around the world. Lastly, an outdoor mesocosm experiment demonstrated that carbamazepine increased invertebrate biodiversity, altered species composition and decreased decomposition. This study provides insight into how environmentally relevant concentrations of carbamazepine may adversely influence freshwater ecosystems on the population, community and ecosystem level.